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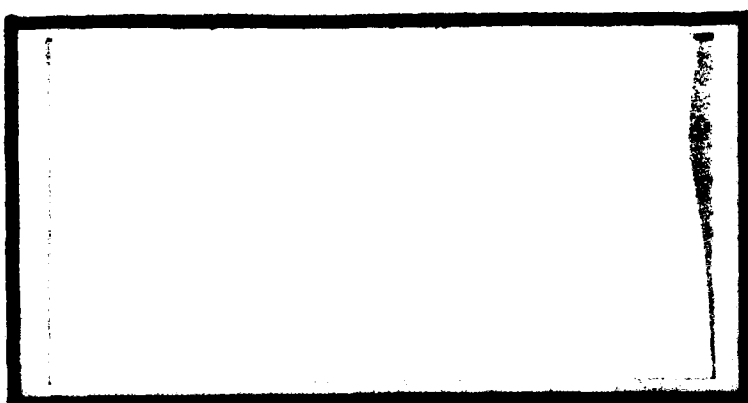
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UTILIZATION OF ADVANCED ACADEMIC  
DEGREES IN ACQUISITION LOGISTICS  
DIVISION UNDER A PERCENTAGE-BASED  
SYSTEM

Michael H. Kruthaupt, Capt, USAF  
Jerry E. Roshto, Capt, USAF

LSSR 48-81 ✓

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✓ The Air Force has tentatively decided to implement a percentage-based system for the assignment of Advanced Academic Degree (AAD) holders. Presently there is no process available to determine what the correct ratio of AAD's to non AAD's should be. The process posited by this thesis measures the level at which specified positions are required to be worked in three specific educational areas; unique knowledge, task complexity, and policy formulation. These three areas are demonstrated to be reasonable differentiators between AAD holders and lesser requirements by showing their relationship to an accepted educational hierarchy, Bloom's Taxonomy. The thesis tests the proposed system on an Air Force work center and concludes that it is a feasible way to establish AAD percentages. ✓

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UTILIZATION OF ADVANCED ACADEMIC DEGREES  
IN ACQUISITION LOGISTICS DIVISION UNDER A  
PERCENTAGE-BASED SYSTEM

A Thesis

Presented to the Faculty of the School of Systems and Logistics  
of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirements for the  
Degree of Master of Science in Logistics Management

By

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June 1981

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of the School of Systems and Logistics in partial fulfillment  
of the requirements for the degree of

MASTER OF SCIENCE IN LOGISTICS MANAGEMENT

Date: 17 June 1981

Ronald H. Blackledge  
COMMITTEE CHAIRMAN

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## Chapter I

### INTRODUCTION

#### BACKGROUND

The military services have long been aware of the importance of advanced, formal education. In the past three decades, however, with the dispersal of American military forces around the globe, there has been an increase in the need for officers with advanced educational degrees to prepare them for a number of roles that go beyond the traditional professional officer's combat mold--technical, managerial, intercultural, and geopolitical to name just a few (12:I-1).

Until 1964, each individual service controlled graduate officer education by developing and adhering to its own standards. In 1964, the Joint Chiefs of Staff (JCS) developed guidelines for identifying, determining, and reviewing the needs for graduate level education of officers. They were not specific, however, about how such needs should be met (12:I-2). The military officer education programs were influenced to a large extent by the philosophies, policies, and practices of each service's distinctive officer personnel management system (12:I-5).

The Air Force presently has approximately 77,600 line officers serving in the grades of lieutenant through lieutenant colonel. Some 30,000 of these officers, or 39%,

have advanced academic degrees. At the same time the Air Force has 8,400 validated jobs for officers serving in these grades, so the number of advanced academic degree holders represent 357% of the Air Force's validated requirements for advanced academic degrees (13:1). If the inventory of Air Force officers is examined by academic specialty code (ASC) only, and compared with a billet-by-billet list of validated requirements for advanced degrees it becomes clear that statistics can be misleading (13:1). This comparison will show that approximately 570 specific requirements exist that cannot be satisfied by anyone in the inventory, at any rank, in any Air Force Specialty Code (AFSC) (13:1). If the inventory of officers possessing advanced degrees is compared by ASC and AFSC together it appears there are about 900 requirements for Master of Science degrees that cannot be satisfied by anyone in the inventory at any rank (13:1). The paradox of the situation seems to be that the number of Air Force officers possessing academic degrees is overwhelmingly in excess of the validated requirements, however, many of these officers either possess degrees that are incompatible with Air Force requirements or the officer is not assigned in an AFSC to effectively use his advanced degree (13:1).

Many of the 30,000 AAD holding officers received their degrees under fully-funded programs (12:I-1). The Air Force Manpower and Personnel Center (MPC) is the agency responsible for the selection of qualified officers to

receive fully-funded graduate education to meet Air Force quotas. A list of officers qualified to undertake the needed graduate education is developed by the Air Force Institute of Technology (AFIT) and is forwarded to the MPC, where selections are made by panels of resource managers and career development monitors. Once the basic selection is made, AFIT selects the school and completes the entry requirements (1:18).

The problem concerning the use of advanced academic degree holders seems to stem primarily from the question, "Is the system of determining graduate degree requirements valid (12:III-1)?" A study conducted by the National Academy of Public Administration in May of 1975 said "no" (12:III-2). The present system used by the Air Force "...tends to begin at the lowest level of the chain of command and is passed up to successively higher authority for approval (12:III-2)." This aspect of the system has come under attack by the Office of Management and Budget (OMB), the Government Accounting Office (GAO), and the Staff of the House Appropriations Committee (12:III-7). The OMB study pointed out,

At all levels within an organization it is natural to desire the best qualified and best trained personnel. The validation process provides a local commander with an opportunity to obtain a more highly trained person, thus, it will be to his advantage and to the chain of command above him to attempt to validate as many billets as possible (12:III-7).

A GAO report pointed out that, "Billets having essentially the same duties have been validated by one command in a service and not by another; or by only one service (12:III-8)." Past studies indicate that the present billet assignment of advanced academic degree holders is ineffective and is not responsive to changes in technology (13:3).

An alternative to the present system is a percentage-based system (13:6). A percentage-based system was used prior to 1965 by the Department of Defense and is currently used to determine requirements for Professional Military Education (PME) (1:12-14). This same system was also suggested in the May 1975 panel report of the National Academy of Public Administration. The percentage-based system would establish a percentage goal within each career field for officers possessing advanced degree education. The goals could be expressed in terms of grade and academic specialty. Separate goals could be established for participation in specific civilian academic institutions and AFIT resident programs, particularly focused in studies relevant to a specific career field (7:2). In an unpublished talking paper the Air Force Institute of Technology said, "The Air Force should adopt a percentage-based system of identifying requirements for officers with advanced degrees (13:6)." The target was defined as educated officers, not validated positions, although the present number of officers in specific functions and units

could provide one basic element of the projections (12:III-13). According to the AFIT paper the feasibility of such projections has already been demonstrated by the Navy, which for several years, has obtained the judgement of expert panels as to likely developments in emerging and existing sub-specialties. This fact has influenced its quotas for educated officers as well as the curricula and course content of its graduate programs (12:III-14). The Air Force Institute of Technology Study further pointed out that:

The principle benefits of a percentage basis for education requirements are: simplicity that allows true management oversight without getting bogged down in micro-management details, reduced costs, and opportunities for flexibility [13:7].

Headquarters Air Force has now chosen, at least tentatively, to implement a percentage-based system for assigning its AAD holding officers (7:1). The Air Force Education Requirements Board (AFERB), at its August 1980 meeting, determined that the logistics career field should serve as the test for the new system and Air Force Logistics Command has agreed to this arrangement (7:1). The AFIT paper previously cited, recommended the use of a work-center as the focal point for the percentage-based system, with the constraint that the work center should be large enough that a reliable estimate of the percentage of advanced degrees can be obtained (13:9).

The decision to implement some type of percentage based system has already tentatively been made, however, the factors to be considered for the development of the percentage-based system are yet to be specifically determined.

### PROBLEM STATEMENT

The U. S. Air Force needs to determine the factors necessary to effectively assign advanced academic degree holders through a percentage-based system, which will better match resources and requirements.

### RESEARCH OBJECTIVES

The general objective of this research is to develop an understanding of the elements necessary to effectively assign advanced academic degree holders via a percentage-based system. The specific objectives emanating from the general objective are:

1. Determine the factors necessary to identify advanced academic degree requirements as a percentage of a work center's total manning for individual AFSC's.
2. Specify a system comprised of factors and the process derived in employing them.
3. Determine the percentage of advanced academic degrees necessary in a given work center for a given AFSC.
4. Evaluate the system in terms of validity and usefulness in deriving percentages of advanced academic degree people in work centers.

### RESEARCH QUESTIONS

1. What factors define the difference between an additional requirement for a person with an advanced

academic degree and one stating needs for ability solely comensurate with being qualified in a given Air Force Speciality code?

2. What process can be used with these factors so that a given work center can be split into those needing advanced academic degrees and those that do not for a given AFSC?

3. In implementing the process what lessons can be learned?

4. How valid and useful is the resulting process in defining a percentage based system for allocating advanced academic degrees?

## Chaper II

### SEEKING THE FACTORS

In late 1965, the Smith Richardson Foundation recognized the crucial role played in an industrial society, like the Air Force, by managers (4:xi). This recognition developed into a comprehensive search for specific factors that might be used to indicate managerial talent and forecast success in the field of management for an individual possessing those factors (4:xi).

The search for specific factors led to a 1966 study conducted by C. E. Jurgensen. In this survey Mr. Jurgensen compiled a list of 120 adjectives frequently used to describe "the type of person most likely to succeed as a key executive in top management (4:7)." He presented this lengthy list to 210 personnel men and executives of civilian industry. The group sorted through the list and selected a total of 24 adjectives that they felt were the 12 most descriptive adjectives and the 12 least descriptive of a potentially successful key executive (4:7). The list for the 12 most descriptive adjectives was comprised of the words: decisive, aggressive, self-starting, productive, well-informed, determined, energetic, creative, intelligent, responsible, enterprising, and clear thinking (4:8). While these are desirable qualities in a particular manager the list does not pinpoint with sufficient precision the

elements necessary for successful management (4:8). Much of the business and psychological literature on this topic is based on such personal experience or opinions surveys about traits possessed by good managers (4:15). None focus directly on educational requirements. It was decided to follow this thought train by attacking educational requirements from a different vantage. If better managers were considered to have, in general, better education (an admittedly tenuous argument) then seeking the traits of better managers might lead to educational differentiators.

Mr. Jurgensen's list, reflective of many such lists, was decidedly hard to use readily as a discriminator and was possibly even contradictory (aggressive vs responsible).

What was needed was a collection of terms that defined more specifically what the job required. In the search for the key traits which combined elements of the list by Jurgensen, we derived the term "focused analysis and problem solving ability." It was decided that this was the critical element of a successful manager. An immediate consideration regarding the newly-derived phrase was whether this composite ability was an innate trait or a learned skill. If it can be seen as a learned skill then we have come full circle and can return to finding educationally defined factors. Focused analysis and problem solving is broken into the ability to analyze, which uses analytical discipline (logic, mathematics, modeling, etc.) and problem solving (primarily clarity of thought in ordering facts and

alternatives). The more one gets into breaking the definitions down, the more parallel to educational objectives they became.

The reader should remember, at this point, that the reason for the excursion into managerial traits was precisely because those were the only factors differentiated which might have some ultimate relationship to education - no direct educational factors had been found. So, while one was comforted by the link between perceived managerial success traits and education, it still left the search for factors essentially at point zero. We once again focused directly on education. Webster's defines (to) educate as "to develop mentally and morally especially by instruction" (14:263). This definition provided a word that will be used interchangeably with both education and training--instruction. Realizing that the difference between education and training is a fine distinction, at best, the term "instruction" will be used where no distinction is required.

Instruction in the Air Force is centered primarily in Air Training Command (ATC). ATC guides the instructional efforts of the Air Force at every level. Whether the student is a new recruit reporting for basic military training or a senior officer attending a senior service school, the instructional techniques employed are guided by ATC (5:p.49-53).

Since ATC is considered successful in its mission of instructing people not only by the Air Force but also by the civilian community, the firm idea of what specific factors are necessary for at least some types of successful leadership might lie within the realm of ATC's instructional manuals (5:97). A review of the Academic Instructor School basic manual, which is the base for instructing academic instructors throughout the Air Force narrows one's focus to a useful concept--Bloom's Taxonomy (3:34).

Bloom's Taxonomy is actually entitled "Taxonomy of Educational Objectives". The work was edited by Benjamin S. Bloom, but is actually a compilation of contributing participants who attended a series of conferences held from 1949 to 1953 (2:0). The book was first published in 1956 with numerous subsequent editions. Bloom's collective ideas have endured and they are today the base for the Air Force instructional system at all levels.

Bloom's Taxonomy is an attempt at a scientific, systematic classification of "educational" objectives (2:1) and Bloom's Taxonomy has endured the test of time. Bloom advances six levels of education: knowledge, comprehension, application, analysis, synthesis, and evaluation (2:201). Each level of the taxonomy is thought to be inclusive of those levels preceding it. Since the levels are cumulative it can be said that a person achieving one level has previously attained the preceding levels. The taxonomy is a hierarchy ranging from knowledge at the lower spectrum to

evaluation at the higher spectrum (2:p.185-191).

The Air Force accepts the precepts of Bloom's Taxonomy, as the base for Air Force instructional systems. The civilian community has acquired some of these instructional guides and also employs them. The fact that the taxonomy is generally accepted by both the military and civilian instructional community is a strong vote for its credence.

It can be argued that an individual can be educated to move higher on Bloom's taxonomy. In fact, that is the basic premise of Bloom. A person first must simply know facts by rote ie., memorizing. He can next comprehend or visualize relationships. Only then can he hope to apply his newly learned information - and so on, through analysis, synthesis and evaluation. It stands to reason that some level of educational ability (probably a range rather than a point) on the taxonomy serves to distinguish advanced academic ability from less advanced academic ability. An area of attention in this thesis is to determine the appropriate location for that cut-off range.

Before attempting to divide the taxonomy for the stated thesis purposes it was decided that maybe it was unwise to leave the hierarchy in its present state. Actually, one can't expect a person who is fully-qualified in a position, to perform at the knowledge level of Bloom's taxonomy. It would stand to reason that anyone in the Air Force who occupies a position, must be expected to perform at the

application level of Bloom's taxonomy as a bare minimum level of achievement. The combination of knowledge, comprehension and application could then be considered to be synonymous with the attainment of a fully-qualified Air Force Specialty Code (AFSC) for any position in the Air Force. This point is the first plateau in the thesis application of Bloom's Taxonomy. When viewing this ability to apply facts in terms of advanced academic degrees one comes to the realization that some advanced degrees are justified solely because they give a person the ability to apply unique knowledge of a specific nature. A Masters degree in nuclear effects gives a specific set of new information regardless of whether it helps analyze, synthesize, etc. It is this unique knowledge at the application level, that differentiates an advanced academic requirement from a lesser one.

Bloom considered the analysis level of educational objectives to be the ability of the individual to take a concept and break it down into its constituent elements or parts such that the relative hierarchy is made clear (2: 205). This level is clearly separated from the application level where the individual must only be able to recall specific and universal truths, understand them and subsequently apply the specifics and universals (2:p.202-205). Might analysis then be said to be a discrete, separate level on the taxonomy that should not be combined with those elements preceding it in the hierarchy? If

analysis won't merge downward with knowledge, comprehension and application one must now consider the possibility of merging it with the next step upward on the hierarchial ladder, synthesis.

Synthesis is considered by Bloom to be the ability of the individual to take the various parts of an entity and rearrange and combine them in such a way as to constitute a pattern or structure not clearly there before (2:206). This definition alludes to the ability of the individual to actually create something new and different from a group of parts or elements. This idea of developing something new and imaginative from the parts or elements of an entity clearly separates the synthesis level of accomplishment from the lower analysis level. If analysis represents a level of learning clearly above the application level yet clearly below the synthesis level it should be retained in its present location as an independent level.

The factor of analysis, when used to differentiate advanced academic requirements, is operative in an environment of complexity. Analysis is easy when facts and relationships are simple. Analysis is difficult when facts and relationships are complex. The complexity of analysis is the deciding factor as to requirements for advanced academic education.

The remaining two levels, synthesis and evaluation both have to do with building a new concept from old facts. The

new concept has its roots in the analysis of a situation but some person is required to rearrange the facts and see them in light of many different future scenarios. This ability is most closely seen as policy formulation in major organizations. These last two Bloom factors are accordingly collapsed to this one. The three resulting levels of Bloom's Taxonomy are, hence: unique knowledge, task complexity, and policy formulation.

## Chapter III

### METHODOLOGY

#### Introduction

Establishing a process that would accurately measure the number of advanced academic degree holders with some consistency should use principles readily available and generally understood. We have already established the use of Bloom's Taxonomy which defines specific levels attained by people either through education or experience, as a common Air Force educational standard. Another evaluation tool used will be verb phrases taken from Air Force Regulation 36-1 which describes what an individual is expected to do while working in a specific Air Force Specialty code (job description). These two accepted tools are combined in establishing a set of questions to ask of a supervisor of personnel who work in that specialty.

#### ESTABLISHING THE PROCESS

Using the modified level of Blooms Taxonomy established in Chapter 2 will provide a base from which to develop a process for identifying positions requiring advanced academic degree holders. Unique knowledge, task complexity and policy formulation are the basic factors to be combined in a process which will discriminate the levels at which people in positions (Air Force Speciality Codes) must perform in order to be effective managers/officers.

The need to identify valid descriptions that were representative of the position being evaluated led to the use of the most available and standard descriptors, verb phrases from Air Force Regulation (AFR) 36-1. This regulation defines the requirements a person must meet in order to be considered fully qualified in all of the Air Force Specialty Codes.

The selection of verb phrases from AFR 36-1 was accomplished by selecting an equal number of phrases from the major sections of the 402X and 662X AFSC's. These two speciality codes, Maintenance Officer and Logistics Plans and Programs officer, were chosen as being fair representatives of the spectrum of typical logistics specialty codes. The objective of selecting key verb phrases from AFR 36-1 is to obtain a broad perspective of duties and responsibilities that represent the scope of activities for that AFSC. The acceptance of AFR 36-1 Air Force wide makes it a valuable and convenient tool for evaluating the system that proposes to identify where a position (slot) requires unusually high utilization of all facets for filling the job description. Ten verb phrases were chosen because the two AFSC's (402X and 662X) could be represented by that number without being redundant or without omitting portions of the job description. The other major reason AFR 36-1 was used was explained in Chapter 2; other phrases to describe successful and high level

managers' attributes could not be defined easily. The natural explanation of the job is crucial in establishing its valid use.

These action phrases encompass tasks required to be performed for that position. The next step was to develop a question that compared the three levels of Bloom's Taxonomy (specific knowledge, task complexity and policy formulation) with the verb phrases. The initial inclination was to ask the supervisors to evaluate a general question on each verb phrase in terms of a single three level modified scale on Bloom's Taxonomy. This method would ask a total of ten questions and each question would represent a position of where the supervisor saw his worker on this hierarchy. When solving multiple problems however, one isn't always on the same level of a collapsed Bloom's hierarchy. A decision has many parts, all of which are neither equally complex nor full of policy implications. Another major draw back to this method of questioning is the use of a subjective measure such as the Lickert scale asking a very few questions about the three measures. Very little opportunity for cross checking validation would exist. For these reasons, measuring each verb phrase relative to its position on a scale defining each Taxonomy level would appear to be more realistic and allow more cross-referencing (See appendix A). As the appendix shows, the questionnaire is a likert type scale giving a numerical code to opinions held about a particular question. The three Taxonomy level questions for

each verb phrase were then aggregated into a composite scale. To further refine the final composite value of the questions into the one scale, a weighting of the three levels of Bloom's Taxonomy was considered necessary. The weighting factors were; unique knowledge,.2; complexity,.5; and policy formulation,.3. As can be seen this places more emphasis on the higher levels on Bloom's Taxonomy, indicating priority for more complex tasks and involvement in policy formulation. This aligns the Taxonomy more closely with perceived managerial requirements which were investigated earlier in the thesis. These weighting factors are the same as those established at an air staff meeting on 18 February 1981 (8), which was held to determine methods and procedures for implementing the assignment of AAD holders under a percentage-based system.

The next step in the process would be to establish the average of the weighted scores for each verb phrase, for each position (See data analysis section of this chapter for treatment of questions). Ten verb phrases for each position would then be averaged giving one composite score for each position (slot). Now that every position in a given speciality code, in a given work center had a composite score attached to it, the problem remained to define which score qualified as AAD candidates and which were too low. To establish the parameter (cut-off) for requiring an AAD, the ALD personnel office (ALD/MO) was queried to identify a

position that clearly required and advanced academic degree and one that clearly did not require an AAD. To be certain that they were identifying the clearly AAD and non AAD positions for the 402X and 662X AFSC, ALD/MO was asked these questions:

- a. If you were told that you were losing one 402X and one 662X position which ones would you give up?
- b. If you were told you were losing all of your AAD positions except one, which 402X and 662X positions would you retain.

Each of these selected slots (for each AFSC) were separated from the rest of the responses when the questionnaires were returned. The weighted composite scores of each of these slots were then established as the high and low standard for each AFSC. A simple average value was established between the high and low values and a lower confidence interval (one-tailed test) was conducted using a 90% confidence interval. The resulting lower composite scale value was used as the cut-off value for positions requiring an AAD. One could then say, depending on the faith he put in Likert Scales, that he established a 90% confidence interval below the selected mean value. Although the real cutoff is unknown, this mean is a realistic starting place.

#### Selecting the Test Organization

To obtain one single Air Force organization that would be representative of the rest of the Air Force is not an easy task. All kinds of problems develop when one attempts

to assess similarities and dissimilarities between various commands and various levels of the command such as Headquarters, Major Commands, intermediate and Base levels. A narrower focus on one organizational level that contained elements from lower levels and the higher levels seemed appropriate. To obtain a flavor of both Air Force Acquisition Logistics Division (AFALD), an intermediate level organization, was chosen. It should be recognized that the test organization best suited for this study is a diverse one which potentially incorporates all the exceptions rather than one for which there are many carbon copies.

#### Data Collection

Having selected the ten verb phrases and recognizing Bloom's Taxonomy as the structure most relevant for soliciting supervisor responses, the questionnaire was developed (See Appendix A). A question utilizing specific knowledge, complexity of task and policy formulation was developed for each of the ten verb phrases. To adequately allow the supervisor to differentiate without allowing too much separation in his response, a five point Lickert type of scale was used. To relieve the respondents monotony associated with the using of the same levels of Bloom's Taxonomy with each verb phrase we used a random number generator to generate a random sequence for the questions. The same random number set was used for both the 402X and

662X AFSC's questionnaire (See Appendix B). This was also done to prevent the supervisors from developing a pattern to the questions. To identify individual and supervisors tenure the questionnaire asked for their response-questions 31 and 32 (see Appendix C).

The five point Lickert Scale was chosen for this questionnaire so that increments from 1-5 would be developed as averages were computed. This scale also lends itself to simple statistical analysis. It should be recognized that, while the data is ordinal, it is treated as interval for purposes of means and standard deviations. Since the resulting answer is not being developed as a precise statement of where advanced academic degrees begin, this license is not considered inappropriate. The system is designed to be a usable indicator of the percentage needs for AAD's, not a precise academic definition. Treatment of the data is covered in the data analysis section of this thesis.

Agreement to interview supervisors of all 402X and 662X AFSC's within ALD was obtained. Hence this thesis is based on a full population and not a sample. To add a sense of organizational commitment a letter soliciting responses to the questionnaire was signed by Col. Montgomery ALD/XR, (see Appendix A). The questionnaire was given to the supervisors personally with one consistent set of instructions (see Appendix D). Envelopes were provided to maintain anonymity

for the return of the questionnaire to an agency within ALD; ALD/XRX. The treatment of the handling of the questionnaire was considered important in that it added a sense of involvement.

### Data Analysis

A discussion of the general procedure for getting at a cut-off value for determining an AAD was discussed at the beginning of this chapter. The values given for responses to each level of Bloom's Taxonomy (unique knowledge, complexity, policy formulation) for each verb phrase was totaled to arrive at an aggregate total for each of the ten phrases. In doing this, the levels of Bloom's Taxonomy were weighted [unique knowledge (.2), complexity (.5) and policy formulation (.3)]. The product of the response value times the weighting index for each level yielded the aggregate total. An example of the treatment of each verb phrase of a questionnaire is contained in Figure 3-1.

Verb Phrase	Knowledge	+ Task Complexity	+ Policy Formulation	= Aggregate Total
1.	.2(5)	+ .5(4)	+ .3(3)	= 3.9
2.				
10.	.2(4)	+ .5(5)	+ .3(3)	= 4.2
Average of Averages =				4.19

Figure 3-1. Treatment of Questionnaires

The positions identified as being clearly not an AAD and clearly AAD had already been figured and treated the same as above. The simple average had been taken to arrive at the mean value for Advanced Academic degree positions. An example of the calculation for 402X AFSC is contained in Figure 3-2.

Non AAD	AAD	
3.07	4.19	$7.26/2 = 3.63$ AAD mean value

Figure 3-2. AAD Mean Calculation for 402X AFSC

Similarity the calculation for the 662X AFSC was calculated with the low value (non AAD position) equal to 2.61 the high value (AAD position) equal to 4.46 with the cut-off value for AAD position for 662X AFSC equal to 3.535. Lower confidence intervals would subsequently be based on these means.

A listing of the basic data from all 402X and 662X positions is contained in Appendix B. You will note that one question concerning of the knowledge level of a verb phrase was not applicable to one 402X position. Five questions (2 knowledge level, 2 complexity and 1 policy formulation level) used with verb phrases were not applicable to two 662X positions. These responses were treated as if no value was assigned by the supervisor and the verb phrase was disregarded in computing the average of averages.

Complete treatment of data will follow in the findings analysis and conclusion chapters of this thesis.

## Chapter IV

### ANALYSIS AND FINDINGS

Ten questionnaires were distributed for the 402X positions and twenty questionnaires for the 662X positions for a total of thirty questionnaires. These thirty questionnaires represented one questionnaire for each of the 402X and 662X positions in ALD. All ten of the 402X questionnaires were returned for a return rate of 100%, eighteen of the 662X questionnaires were returned for a 90% return rate. Overall, there was a 93% return rate for the questionnaires distributed. No effort was made by the authors to trace the missing questionnaires since anonymity had been assured those supervisors who were interviewed with the questionnaire. Nothing in the organization setting or interviews indicated that there was potential for any of the twenty 662X positions to be radically different, thus the missing questionnaires were not considered a fatal flaw.

The authors took the 402X questionnaire with the highest mean value and plotted it on a five point composite Likert scale. This value was found to be 4.19. The high mean was from a position previously validated by ALD as an AAD position. The authors then took the questionnaire with the lowest mean value. This value was also plotted on a five point Likert scale. The value, 3.07 was for a position that was clearly not an AAD slot in ALD, as identified by

ALD Personnel Office (ALD/MO). The two values, 4.19 and 3.07 were then summed and divided by two to arrive at the simple average value of 3.63. This simple average value could serve as the cut-off value for whether a position should be considered an AAD slot. Using 3.63 as the cut-off, the findings indicated that five of the ten 402X positions assigned to ALD or 50% should be manned by an AAD. To establish a cutoff that would more surely include all valid AAD positions, a confidence interval ( $\alpha$ ) around the simple average was taken. The first  $\alpha$  value considered was 0.05. Using 0.05 or 95% confidence, it was calculated that the 0.05. cut-off would drop to a value of 2.95 which was lower than the obviously non-AAD questionnaire mean. Using 2.95 as the cut-off in the process indicated that all 10 or 100% of the 402X positions assigned to ALD required an AAD. This was highly unlikely.

An value of 0.10 was then used to establish the confidence interval around the simple average. Using the value of 0.10, or 90% confidence, gave a cut-off of 3.10. This cut-off value, when applied to the process, indicated that eight of the ten 402X positions in ALD should be AAD slots.

Another test of sensitivity was then applied to the process using an  $\alpha$  value of 0.20. This gave a confidence interval around the simple average that could be used with 80% confidence. The cut-off established by this process was found to be 3.28. Using this cut-off revealed that seven of

the ten slots assigned to ALD should be AAD's.

Seventy percent manning with AAD's still appeared too high but a lower confidence level would be highly inconclusive. This finding presented a dilemma. In an effort to determine the position of the cut-off at a realistic level, the confidence in that determination must be lowered to a level approaching pure chance. This finding was deemed unacceptable.

Reflecting on the process led back to the rationale behind the simple average of 3.63. Was 3.63 a logical choice for a cut-off point? Using a consistent strategy for defining a logical standard for AAD's but altering tactics, the authors chose to compute a confidence interval around a different figure. The choice for that figure appeared obvious. It had not proven to be feasible to construct a confidence interval around the questionable questionnaire mean. The statistical properties of a confidence interval are such that one has a given confidence that a true population value will be within boundaries of an interval constructed around a sampled number. Picking the lower boundary of the confidence interval as a cut-off, as had been done, says more about the width of the interval than the value of the boundary number. Statistically the lower boundary has meaning related to the derived mean of 3.63 but, in itself, provides no valid cut-off for valid vs non-valid AAD positions. If, however, one took a low-sided

confidence interval around a known AAD position, the lower boundary number might be a fair estimator of the general region where advanced academic degrees should prevail over bachelor degrees. This approach was tried next.

A confidence interval using  $\alpha$  of 0.05 was constructed around 4.19. The proposed cut-off value was computed to be 3.5018. Applying the questionnaire responses to this figure resulted in a percentage of 70%, or seven AAD positions in ALD for 402X AFSC's.

In the next attempt an  $\alpha$  value at 0.10 or 90% confidence was set. The figure resulting from this computation was 3.65. Using this as the cut-off, five of the ten 402X positions in ALD would indicate a requirement for an AAD.

To complete the sensitivity analysis of the process a confidence interval around the obviously AAD questionnaire figure using an  $\alpha$  value of 0.20 was used. This computation yielded a proposed cut-off of 3.83 which would indicate that three of the ten 402X positions in ALD should be manned by an AAD. Thus, at 80% confidence 30% of ALD would be AAD's; at 90% confidence 50% would be AAD's and at 95% confidence, 70% would be AAD's in the 402X AFSC.

The same approach that was used on the 402X positions was applied to the 662X positions. The highest mean value of the questionnaires was selected and plotted on a scale of one to five. That value for 662X positions was found to be 4.46. This value was designated as the obviously AAD

position. Next, the lowest mean value of the 662X questionnaire was determined and this one was designated as the obviously non-AAD position. This value was found to be 2.61. Taking the highest value of 4.46 and the lowest value of 2.61, summing them and dividing by two produced a simple average figure of 3.535. Using this value of 3.535 as the cut-off figure resulted in eight of the eighteen 662X positions assigned to ALD being designated as AAD positions.

The first confidence level considered was 95% or an value of 0.05. This figure gave a cut-off figure of 2.6299. But the 2.6299 value again was extremely close to the position originally designated as an obviously non AAD position.

At this figure, ALD would have to be manned at the 94.4% AAD rate for 662X's - highly unrealistic.

The confidence level was lowered to 90%. This time the resulting figure was 2.8296. Once again the percentage was 94.4% for AAD designation. Even at the 90% confidence level the cut-off figure was unrealistically high. Again, the value of the obviously AAD 662X positions was used, as had been done with the 402X positions assigned to ALD.

A 95% confidence interval around 4.46 was constructed. This computation gave a cut-off value of 3.5549 and resulted in eight of the eighteen positions being designated as AAD positions. Eight of eighteen positions would be a 44.4% AAD

manning figure.

Again testing the sensitivity of the equation, the values were refigured using a 90% confidence interval. The resulting figure was 3.7546. This cut-off figure also gave eight out of eighteen AAD slots or 44.44% - no change from the 95% confidence interval.

The process was repeated using a confidence interval of 80%. This computation resulted in a cut-off of 3.9968. This figure also showed a ratio of eight of eighteen 662X positions as AAD positions. While the 402X calculations had been moderately sensitive to confidence intervals ranging from 80 to 95%, the 662X figures were not. Statistics being a dimensionless discipline, one must conclude that this difference is inherently in the numbers and not in some attribute of either field. In fact, the population of 402X's was 10 while 662X's was 18 showing that for samples around 18 the confidence interval is insensitive at the 80 to 95% range. ALD had a smaller sample in 402X's than we would recommend taking for practical purposes. This is a valuable finding because it demonstrates that the process will tend to be relatively stable in its prediction down to samples of around 18. For further purposes of this thesis we used a 90% confidence interval. For samples larger than 18 it really doesn't matter within the 80 to 95% range.

Thus, by electing to use the truely AAD position and constructing a 90% confidence interval around it has yielded a cut-off of 3.65 for 402X positions in ALD indicating five

of the ten positions or 50% AAD manning. In the 662X career field the cut-off was 3.9918. This figure resulted in eight of eighteen positions as being AAD positions or 44.4%.

## Chapter V

### SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

#### Research Summary

We computed a 50% manning figure for AAD's for the 402X AFSC versus 10% identified under the present billet system and a manning figure for 662X AAD's of 44% versus 20% identified by billets. Using actual billets as a measure of validity for the process would lead one to believe that it overstates the requirement. This argument is not true. All of the ALD jobs are coded 1AMJ - acquisition logistics. The graduate program started in 1977 and 20 billets were validated at that time. Since then, until this past year, no new billets were validated. Two major reasons for this emerge. First, the Air Force was capping new AAD slots, making it highly difficult to justify a new one without destroying an old one. Secondly, the MPC routinely ignores AAD codes if higher priorities occur and they often do in ALD's primary AFSC's. Recruiting in ALD has essentially been done on a personal basis. Interestingly enough, one can argue that there is a high correlation between people doing outstanding jobs and those holding AAD's. Both characteristics are traits of a high IQ. The acquiring of talented people by personal recruiting has not seemed to hurt ALD but one must recognize that the entire Air Force cannot function this way. At any rate, this process has led

to ignoring the billet system in ALD until the recent past. When this research began, ALD had 14 AAD positions validated, currently 26 more positions have been validated with more AAD positions being considered. Thus, even though the percentages arrived at by the thesis process are higher, ALD has already indicated the need for an increasing number of validated positions and is seeking additional validations.

Another argument for more AAD's concerns the complexity of ALD versus other Air Force organizations. To gain a better appreciation of the complexity of ALD, there are 298 people assigned. These 298 people represent 31 AFSC's according to ALD/MO. This is a very high number of AFSC's being represented by a small organization. Both ALD's current efforts towards more validated billets and the high complexity of the organization argue that the findings of this thesis are reasonable.

The weighting of .2 for knowledge, .5 for task complexity, and .3 for policy formulation seems a good choice for ALD. This weighting might not be optimal for all organizations and should be tested in different organizations. It might be possible to use this process, varying the weighting factors, rather than using the average values for the AAD cut-off for each organization.

### Conclusions

When this study began we set out to answer four

research questions. The questions and the summary answers follow:

1. What factors define the differences between an additional requirement for a person with an advanced academic degree and one stating needs for ability solely commensurate with being qualified in a given Air Force Speciality Code?

Bloom's Taxonomy defines this difference. Collapsing Bloom's Taxonomy to knowledge, task complexity, and policy formulation aided the development of the process to make the necessary differentiation. The three resulting levels were seen to have identifiable characteristics in reviewing job assignments in the Air Force.

2. What process can be used with these factors so that a given work center can be split into those needing advanced degrees and those that do not for a given AFSC?

The selection of an obviously AAD position, the construction of a lower statistical confidence interval around it and the comparison of other positions in the same AFSC and work center is the process that will differentiate between those positions requiring an AAD and those that do not.

3. In implementing the process what lessons were learned?

It was learned that the obviously AAD position is the place to start the process rather than around a simple average between two extreme positions relative to AAD's. The process is insensitive to confidence interval changes

between 80 and 100% and is therefore, stable for sample sizes of 18 or larger. Allowances might need to be made for smaller samples.

4. How valid and useful is the resulting process in defining a percentage based system for allocating advanced academic degrees?

The process proposed a 44% and a 50% requirement for AAD's in the 662X AFSC and 402X AFSC respectively, compared to a 10% and 20% requirement by the billet system. While, this process might not be optimal, it represents an improvement over the present billet system, in that it is closer to the judgement of ALD leadership than billets.

Recommendations For Future Research

Before the system can be used throughout the Air Force, it must be extended to a broader system. The thesis forms the base concept for a new way of understanding advanced educational requirements. The old billet system was illogical. In order to justify a position, a supervisor had to write in terms of specific attributes which often paralleled unique courses or subjects in a field. The more specific one got, the more likely approval would be forthcoming. Essay contests on small segments of unique knowledge were the basic construction materials of the billet system.

This proposed system is less precise but,

paradoxically, more accurate. Attributes of an AAD holder are those aligned with clear, logical, analysis and thought. The logical base of the system is, therefore, far sounder than the billet system and the thesis has shown a process which tends to be stable in the 80 - 95% confidence interval for numbers larger than 17 samples.

The broader system should realize that the new construction material is a work center analysis instead of individual supervisor requests. Once the work center is evaluated, for a given AFSC, several alternatives are available.

Probably the soundest method would be to take a representative work group sample from every level of Air Force organizations and construct total requirements for any AFSC by level.

A second alternative would be to take one or more levels within the Air Force and ratio other levels to them. The beauty of this second method is its simplicity and ease.

A good compromise might be to do the actual counting of alternative one and let the empirical evidence define the ratio for future use under alternative two.

As simple as these alternatives are to write, they will take much time and judgement to carry out. The basic underlying correctness of this approach cannot be destroyed. A tenuous chain of too many ratios built on preceding ratios can, however, make the final answers unrelated to the basic logical premises. Just as important, such ratios might not

remain stable in the face of future manning shortages and declining experience levels. It would be tough to argue for 70% AAD manning in a specialty if 50% of the AFSC were second lieutenants. Somewhere, the valid arguments of what is required in AAD's must meet the true test of what is available. No logical system, even this one, can ignore the need for senior judgement in tempering output answers with real world constraints.

APPENDICES

APPENDIX A  
QUESTIONNAIRES

17 APR 1981

(See Distribution)

1. A new percentage-based system of determining Advanced Academic Degree (AAD) requirements is being espoused by HQ USAF/LEX. The new system will consist of two interrelated sets of procedures, one for determining requirements and one for insuring the effective utilization of AAD holders. Requirements will be identified based on educational standards and goals for each career field, and utilization will be effected by monitoring AAD requirements to functional work centers.
2. The Acquisition Logistics Division has been selected as the test arena for the new system. Research into specific applications is currently being conducted by a thesis team from the AFIT Graduate Logistics program. This team is distributing questionnaires to various supervisors in the AFALD, and your cooperation is requested to make this effort a success. Completing this questionnaire in a conscientious manner will be greatly appreciated.
3. Anonymity is assured as no names are solicited, and individual information will not be released. Please feel free to express your views openly where appropriate. This is your opportunity to help make a change that promises to deliver a more efficient system for the assignment of AAD holders throughout the Air Force as well as the AFALD.
4. Please return your completed questionnaires to Jerry Harrison, XRX, 56121, by COB 24 Apr 80.

  
RICHARD D. MONTGOMERY, Colonel, USAF  
Deputy for Acquisition Plans & Analysis

- 3 Atch**
- 1. Questionnaire for 6624 Positions**
  - 2. Questionnaire for 4024 Positions**
  - 3. Positions Requiring a Questionnaire**

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This questionnaire solicits inputs of supervisors of Logistics Plans and Programs Officers within Acquisition Logistics (ALD). The supervisor should complete one questionnaire for each officer slot assigned to him in the 662X career field.

For purposes of this questionnaire we define specific job knowledge, complexity of task, and policy formulation as follows:

1. specific job knowledge - Unique knowledge not provided by Air Force technical schools or short courses and not normally contained in the person's undergraduate degree program.
2. complexity of task - Requires the officer to focus and analyze a complex problem in order to arrive at a feasible solution.
3. policy formulation - Requires the officer to become fully aware of all aspects of the problem in order to formulate new directives (policy) and follow up on policy implications.

Below are items which evaluate phrases used to describe duties and responsibilities of officers in the 662X career field. Read each statement carefully and decide to what extent the position (slot) requires the officer to perform in your organization. Indicate the extent that the statement is true by choosing the response below which best represents required job performance, not actual job performance.

- 1 = Not at all
- 2 = To a small extent
- 3 = To a moderate extent
- 4 = To a large extent
- 5 = To a very large extent

Please place your response in the blank provided for each question.

- \_\_\_\_\_ 1. To what extent does this officer need specific knowledge to direct and coordinate logistics plans and programs?
- \_\_\_\_\_ 2. To what extent are complex procedures used in developing logistics support policies, concepts, and system?
- \_\_\_\_\_ 3. To what extent does this officer formulate policy used to develop logistics support policies, concepts, and system?
- \_\_\_\_\_ 4. To what extent is this officer formulating policy which manages and controls worldwide depot level repair, maintenance, modification, overhaul, and testing of weapon systems?
- \_\_\_\_\_ 5. To what extent is specific knowledge required of this officer to manage and control worldwide depot level repair, maintenance, modification, overhaul, and test weapon systems?
- \_\_\_\_\_ 6. To what extent is this officer required to use specific knowledge in planning and organizing logistics plans and program activities?
- \_\_\_\_\_ 7. To what extent of complexity is this officer's task when he serves as Program Office staff focal point for logistics throughout the acquisition life cycle?
- \_\_\_\_\_ 8. To what extent is this officer required to make complex decisions when translating program requirements and specifications into logistics support requirements?
- \_\_\_\_\_ 9. To what extent is complexity involved in developing, initiating, integrating and managing all logistics actions associated with life cycle management of weapon systems, subsystems and equipment?
- \_\_\_\_\_ 10. To what extent is this officer involved in policy formulation in directing or coordinating logistics plans and programs?

- \_\_\_\_\_ 11. To what extent is the complexity of directing or coordinating the preparation of logistics plans and programs performed by this officer?
- \_\_\_\_\_ 12. To what extent is this officer required to have specific knowledge to serve as Program Office staff focal point for logistics throughout the acquisition life cycle?
- \_\_\_\_\_ 13. To what extent does this officer perform complex joint planning with staff activities, other military services, and civilian agencies?
- \_\_\_\_\_ 14. To what extent is this officer required to use specific knowledge in accomplishing joint planning with staff activities, other military services, and civilian activities?
- \_\_\_\_\_ 15. To what extent does this officer develop policy in accomplishing joint planning with staff activities, other military services and civilian agencies?
- \_\_\_\_\_ 16. To what extent is this officer establishing policy when translating program requirements and specifications into logistics support requirements?
- \_\_\_\_\_ 17. To what extent does this officer formulate policy when serving as the deputy program manager for logistics (DPML) or assistant to the DPML?
- \_\_\_\_\_ 18. To what extent is this officer performing complex duties when he serves as the deputy program manager for logistics (DPML) or assistant to the DPML?
- \_\_\_\_\_ 19. To what extent is this officer involved in formulating policy when he serves as Program Office staff focal point for logistics throughout the acquisition life cycle?
- \_\_\_\_\_ 20. To what extent does this officer use specific knowledge to develop logistics support policies, concepts, and systems?

- \_\_\_\_\_ 21. To what extent is specific knowledge required by this officer to develop, initiate, integrate, and manage all logistics actions associated with life cycle management of weapon systems, subsystems, and equipment?
- \_\_\_\_\_ 22. To what extent is specific knowledge required by this officer when he serves as the logistics focal point for coordination with DOD, joint activities, major commands, representatives of foreign governments, and Government contractors for international logistics/security assistance?
- \_\_\_\_\_ 23. To what extent is specific knowledge required by this officer when he translates program requirements and specifications into logistics support requirements?
- \_\_\_\_\_ 24. To what extent does this officer formulate policy when developing, initiating, integrating, and managing all logistics actions associated with life cycle management of weapon systems, subsystems, and equipment?
- \_\_\_\_\_ 25. To what extent of complexity is this officer's task of serving as the logistics focal point for coordination with DOD, joint activities, major commands, representatives of foreign governments, and Government contractors for international logistics/security assistance matters?
- \_\_\_\_\_ 26. To what extent does this officer perform complex planning and organizing logistics plans and program activities?
- \_\_\_\_\_ 27. To what extent is this officer involved in formulating policy when he serves as the logistics focal point for coordination with DOD, joint activities, major commands, representatives of foreign governments, and Government contractors for international logistics/security assistance matters?
- \_\_\_\_\_ 28. To what extent does this officer require specific knowledge to serve as the deputy program manager for logistics (DPML) or assistant to the DPML?

- \_\_\_\_\_ 29. To what extent is this officer involved in formulating policy used to plan and organize logistics plans and program activities?
- \_\_\_\_\_ 30. To what extent does this officer perform complex actions in managing and controlling worldwide depot level repair, maintenance, modification, overhaul, and test weapon systems?

Please respond appropriately to the following statements.

31. How long has this officer been under your supervision?
32. How long have you been the supervisor of this organization?
33. Is this position (slot) manned by an officer with the required experience level?
34. If this officer were to be replaced and you had to select the individual to replace him, what are the qualifications the replacement would need to possess to fill this position?

This questionnaire solicits inputs of supervisors of Aircraft Maintenance Officers within Acquisition Logistics (ALD). The supervisor should complete one questionnaire for each officer slot assigned to him in the 402X career field.

For purposes of this questionnaire we define specific job knowledge, complexity of task, and policy formulation as follows:

1. specific job knowledge - Unique knowledge not provided by Air Force technical schools or short courses and not normally contained in the person's undergraduate degree program.
2. complexity of task - Requires the officer to focus and analyze a complex problem in order to arrive at a feasible solution.
3. policy formulation - Requires the officer to become fully aware of all aspects of the problem in order to formulate new directives (policy) and follow up on policy implications.

Below are items which evaluate phrases used to describe duties and responsibilities of officers in the 662X career field. Read each statement carefully and decide to what extent the position (slot) requires the officer to perform in your organization. Indicate the extent that the statement is true by choosing the response below which best represents required job performance, not actual job performance.

- 1 = Not at all
- 2 = To a small extent
- 3 = To a moderate extent
- 4 = To a large extent
- 5 = To a very large extent

Please place your response in the blank provided for each question.

- \_\_\_\_\_ 1. To what extent does this officer need specific knowledge to direct or supervise preparation of maintenance records and reports?
- \_\_\_\_\_ 2. To what extent are complex procedures used in developing and improving techniques and procedures for various maintenance activities by this officer?
- \_\_\_\_\_ 3. To what extent does this officer formulate policy used to develop and improve techniques and procedures for various maintenance activities?
- \_\_\_\_\_ 4. To what extent is this officer formulating policy which establishes and monitors on-the-job-training and selects individuals for attendance at formal and special courses to ensure qualifications of assigned personnel?
- \_\_\_\_\_ 5. To what extent is specific knowledge required of this officer to establish and monitor on-the-job training and to select individuals for attendance at formal and special courses to ensure qualifications of assigned personnel?
- \_\_\_\_\_ 6. To what extent is this officer required to use specific knowledge in planning, organizing and directing maintenance activities?
- \_\_\_\_\_ 7. To what extent does this officer perform complex supervision or technical maintenance functions - including evaluating effectiveness of the system and recommending changes?
- \_\_\_\_\_ 8. To what extent is this officer required to make complex decisions when advising commanders and staff activities on the technical aspects, capabilities of maintenance systems and operational status?

- \_\_\_\_\_ 9. To what extent is this officer's relationships complex in maintaining liaison with R&D activities, military activities, and representatives of private and public agencies to keep abreast of managerial and technological improvements?
- \_\_\_\_\_ 10. To what extent is this officer involved in policy formulation in directing or supervising the preparation of maintenance records and reports?
- \_\_\_\_\_ 11. To what extent is the complexity of directing or supervising the preparation of maintenance records and reports performed by this officer?
- \_\_\_\_\_ 12. To what extent is this officer required to have specific knowledge to supervise or perform technical maintenance functions - including evaluating effectiveness of the system and recommending changes?
- \_\_\_\_\_ 13. To what extent does this officer perform complex planning and organizing of maintenance facilities?
- \_\_\_\_\_ 14. To what extent is this officer required to use specific knowledge in planning and organizing maintenance facilities?
- \_\_\_\_\_ 15. To what extent does this officer develop policy in planning and organizing maintenance facilities?
- \_\_\_\_\_ 16. To what extent is this officer establishing policy when advising commanders and staff activities on the technical aspects, capabilities and maintenance systems and operational status?
- \_\_\_\_\_ 17. To what extent does this officer formulate policy in developing staff studies and reports on maintenance matters including changes in maintenance design requirements etc.?
- \_\_\_\_\_ 18. To what extent is this officer performing complex staff studies and reports on maintenance matters including changes in maintenance design requirements etc.?

- \_\_\_\_\_ 19. To what extent is this officer involved in formulating policy for the supervision or performance of technical maintenance functions - including evaluating effectiveness of the system and recommending changes?
- \_\_\_\_\_ 20. To what extent does this officer use specific knowledge to develop and improve procedures and techniques for various maintenance activities?
- \_\_\_\_\_ 21. To what extent is specific knowledge required by this officer to maintain liaison with R&D activities, military activities, and representatives of private and public agencies to keep abreast of managerial and technological improvements?
- \_\_\_\_\_ 22. To what extent is specific knowledge required by this officer to coordinate his maintenance activities with other base and maintenance agencies, i.e. supply, munitions, etc.?
- \_\_\_\_\_ 23. To what extent is specific knowledge required by this officer to advise commanders and staff activities on the technical aspects, capabilities of maintenance systems and B operational status?
- \_\_\_\_\_ 24. To what extent does this officer formulate policy for maintaining liaison with R&D activities, military activities and representatives of private and public agencies to keep abreast of managerial and technological improvements?
- \_\_\_\_\_ 25. To what extent of complexity is this officer's task of coordination of his maintenance activities with other base and maintenance agencies, i.e. supply, munitions, etc.?
- \_\_\_\_\_ 26. To what extent does this officer perform complex planning, organizing and directing of maintenance activities?
- \_\_\_\_\_ 27. To what extent is this officer involved in formulating policy on the coordination of maintenance activities with other base agencies and maintenance agencies, i.e. supply, munitions, etc.?

- \_\_\_\_\_ 28. To what extent does this officer require specific knowledge to perform staff studies and reports on maintenance matters including changes in maintenance design requirements etc.?
- \_\_\_\_\_ 29. To what extent is this officer involved in formulating policy used to plan, organize and direct maintenance activities?
- \_\_\_\_\_ 30. To what extent does this officer perform complex actions in establishing and monitoring on-the-job training and selecting individuals for attendance at formal and special courses to ensure qualifications of assigned personnel?

Please respond appropriately to the following statements.

31. How long has this officer been under your supervision?
32. How long have you been the supervisor of this organization?
33. Is this position (slot) manned by an officer with the required experience level?
34. If this officer were to be replaced and you had to select the individual to replace him, what are the qualifications the replacement would need to possess to fill this position?

APPENDIX B  
TREATMENT OF QUESTIONNAIRE DATA

### Treatment of Questionnaire Data

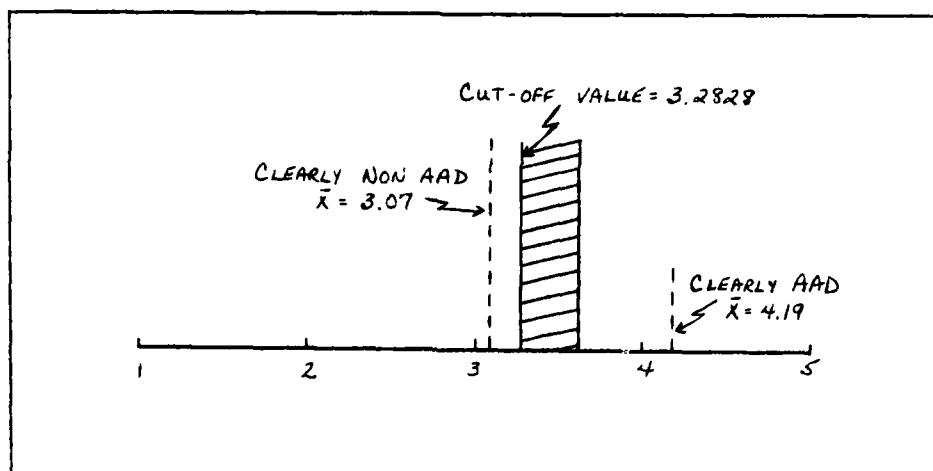
The questionnaire questions were rearranged to break-up any pattern the supervisor may develop in answering the questions. The rearrangement was accomplished using a random number generator and the same numbering system was used for both the 402X and 662X questionnaires. The order of questionnaire answers is given in the following matrix:

Verb Phrase	Unique Knowledge	Task Complexity	Policy Formulation
1	1	11	10
2	20	2	3
3	5	30	4
4	6	26	29
5	12	7	19
6	23	8	16
7	21	9	24
8	14	13	15
9	28	18	17
10	22	25	27

Each questionnaire would then have 30 responses, 10 in each collapsed Bloom Taxonomy category. Each category column of ten responses was summed and divided by 10, giving a category average. Thus there was one average defined for unique knowledge, complexity, and policy formulation on each questionnaire (for a total of three averages per questionnaire). Each individual category was weighted using 0.2 for unique knowledge, 0.5 for complexity and 0.3 for policy formulation. These weighted averages were summed to get a single composite value for each questionnaire. Raw data from the questionnaires is presented on the following

two pages.

The value of each questionnaire was thus established and determined to be above (AAD position) or below (non AAD position) the established cut-off for AAD positions. This cut-off was established by using a one-tailed (lower confidence interval) test using the following formula:  $L = \bar{x} - Z (1 - \alpha) \sigma(\bar{x})$  [11:248]. The interval (cut-off) was computed for a 95, 90 and 80 percent confidence level. The following values were computed for the 402X AFSC:



402X Averages of Responses

# 402X AFSC RAW DATA

QUESTIONNAIRE	1	2	3	4	5	6	7	8	9	10
QUESTIONS										
1	5	2	3	4	4	NA	4	2	4	2
2	5	4	4	4	4	2	5	4	2	5
3	4	3	4	2	2	3	5	5	5	4
4	3	1	1	1	1	1	5	3	1	2
5	4	1	1	2	2	1	4	2	2	1
6	5	4	3	4	4	4	5	5	3	4
7	5	5	5	3	3	4	3	5	5	4
8	5	4	4	4	4	4	4	5	4	2
9	5	4	5	4	4	5	5	5	5	4
10	3	2	4	2	2	3	4	5	3	2
11	4	2	2	2	2	2	4	5	2	2
12	3	5	4	4	4	5	3	5	4	4
13	3	4	4	3	3	4	5	5	2	3
14	3	4	3	4	4	4	4	5	2	3
15	4	3	4	2	2	3	4	5	2	2
16	3	4	4	2	2	4	5	5	4	2
17	5	4	5	2	2	5	4	5	4	5
18	5	4	4	4	4	4	4	5	4	5
19	4	4	3	2	2	4	4	5	5	4
20	5	4	4	4	4	4	4	4	4	4
21	5	5	5	4	4	5	5	5	4	4
22	4	5	5	4	4	2	3	2	4	2
23	5	5	4	4	4	4	4	2	4	2
24	4	4	4	2	2	2	5	5	4	3
25	5	5	5	4	4	5	3	1	5	2
26	4	4	3	4	4	5	5	5	4	1
27	3	4	4	2	2	3	3	2	4	3
28	5	4	3	4	4	4	4	5	3	5
29	4	4	4	2	2	5	4	3	4	3
30	3	2	1	3	3	1	4	2	2	3

662X AFSC RAW Data

Questionnaire		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Questions	1	5	5	5	3	3	3	4	4	4	4	4	4	4	4	4	4	4	5
	2	4	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5
	3	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3
	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	6	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	7	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	8	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	9	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	10	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	11	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	12	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	13	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	14	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	15	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	16	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	17	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	18	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	19	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	20	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	21	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	22	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	23	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	24	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	25	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	26	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	27	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	28	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	29	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	30	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

#### 402X Calculations

For:  $\alpha = .05$  (.95)  $L = 2.9488$   
 $\alpha = .10$  (.90)  $L = 3.0986$   
 $\alpha = .20$  (.80)  $L = 3.2828$

As the confidence level increases ( $\alpha$  becomes smaller) the value becomes smaller capturing all of the questionnaire values at the 95% confidence level. The breakout of AAD to Non AAD positions are as follows for the various confidence levels:

	AAD POSITIONS	NON AAD POSITIONS
$\alpha = .05$ (.95)	10	0
$\alpha = .10$ (.90)	8	2
$\alpha = .20$ (.80)	7	3

The same confidence levels were computed using the same formula except the interval was calculated around the value of the clearly AAD position ( $\bar{x} = 4.19$ ). The following values resulted:

FOR		AAD POSITIONS	NON AAD POSITIONS
$\alpha = .05$ (.95)	$L = 3.5018$	7	3
$\alpha = .10$ (.90)	$L = 3.6536$	5	5
$\alpha = .20$ (.80)	$L = 3.8378$	3	7

### 402X Calculations

To compute the mean values for each 402X questionnaire the matrix at the front of this appendix was used with values:

#### Questionnaire Number 1

1	$5(.2) + 4(.5) + 3(.3) = 3.9$
2	$5(.2) + 5(.5) + 4(.3) = 4.7$
3	$4(.2) + 3(.5) + 3(.3) = 3.2$
4	$5(.2) + 4(.5) + 4(.3) = 4.2$
5	$3(.2) + 5(.5) + 4(.3) = 4.3$
6	$5(.2) + 5(.5) + 3(.3) = 4.4$
7	$5(.2) + 5(.5) + 4(.3) = 4.7$
8	$3(.2) + 3(.5) + 4(.3) = 3.0$
9	$5(.2) + 5(.5) + 5(.3) = 5.0$
10	$4(.2) + 5(.5) + 3(.3) = 4.2$

$$\bar{x} = 4.19$$

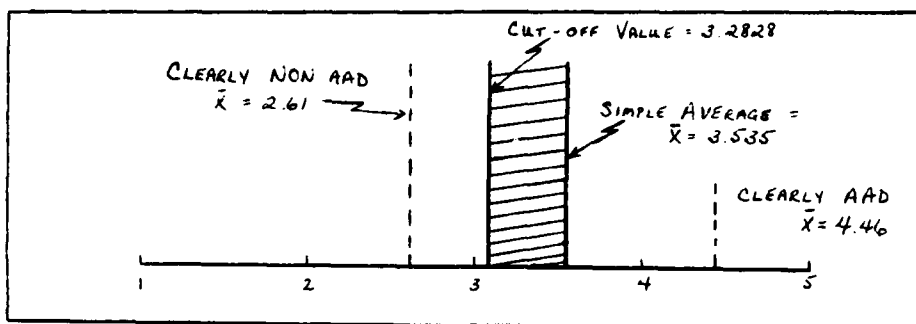
$\bar{x}$  value for questionnaires 2 - 10 are as follows:

- 2.  $\bar{x} = 3.67$
- 3.  $\bar{x} = 3.66$
- 4.  $\bar{x} = 3.14$
- 5.  $\bar{x} = 3.08$
- 6.  $\bar{x} = 3.08$
- 7.  $\bar{x} = 4.19$
- 8.  $\bar{x} = 4.13$
- 9.  $\bar{x} = 3.51$
- 10.  $\bar{x} = 3.07$

## 662X Calculation

The mean value for each of the 662X questionnaires were treated exactly the same as the 402X questionnaires. The following values were computed using the simple average value ( $\bar{x} = 3.535$ ) of the clearly AAD and clearly non AAD positions for the 662X AFSC.

For:  $\alpha = .05$  (.95)  $L = 2.6299$   
 $\alpha = .10$  (.90)  $L = 2.8296$   
 $\alpha = .20$  (.80)  $L = 3.067$



662X Average of Responses

As the confidence level increases the value becomes smaller, capturing all but one of the questionnaire values at the 90 and 95 percent confidence levels. The breakout of AAD to non AAD positions is as follows for the various confidence levels:

FOR	AAD POSITIONS	NON AAD POSITIONS
$\alpha = .05$ (.95)	17	1
$\alpha = .10$ (.90)	17	1
$\alpha = .20$ (.80)	16	2

# 662X Calculations

The same confidence levels were computed using the same formula except the interval was calculated around the value of the clearly AAD position ( $\bar{x} = 4.46$ ). The following values resulted:

	AAD Positions	Non AAD Positions
For $\alpha = .05$ (.95) $L = 3.5549$	8	10
$\alpha = .10$ (.90) $L = 3.7546$	8	10
$\alpha = .20$ (.80) $L = 3.9968$	8	10

To compute the  $\bar{x}$  values for each 662X questionnaire, the matrix at the front of this appendix was filled in with values:

Questionnaire Number 1						
1	5(.2)	+	4(.5)	+	5(.3)	= 4.5
2	4(.2)	+	4(.5)	+	5(.3)	= 4.3
3	4(.2)	+	4(.5)	+	4(.3)	= 4.0
4	4(.2)	+	4(.5)	+	4(.3)	= 4.0
5	5(.2)	+	5(.5)	+	4(.3)	= 4.7
6	4(.2)	+	5(.5)	+	5(.3)	= 4.8
7	5(.2)	+	4(.5)	+	5(.3)	= 4.5
8	4(.2)	+	4(.5)	+	5(.3)	= 4.3
9	5(.2)	+	4(.5)	+	5(.3)	= 4.5
10	5(.2)	+	5(.5)	+	5(.3)	= 5.0
$\bar{x} = 4.46$						

### 662X Calculations

$\bar{x}$  values for questionnaires 2-18 are as follows:

2	$\bar{x} = 4.40$	11	$\bar{x} = 3.32$
3	$\bar{x} = 2.61$	12	$\bar{x} = 4.30$
4	$\bar{x} = 4.25$	13	$\bar{x} = 2.89$
5	$\bar{x} = 4.01$	14	$\bar{x} = 3.28$
6	$\bar{x} = 4.06$	15	$\bar{x} = 3.28$
7	$\bar{x} = 3.52$	16	$\bar{x} = 3.28$
8	$\bar{x} = 4.24$	17	$\bar{x} = 3.28$
9	$\bar{x} = 3.31$	18	$\bar{x} = 4.13$
10	$\bar{x} = 3.31$		

APPENDIX C  
RESPONSES IDENTIFIED WITH LEVELS

This appendix tabulates the supervisors' responses to questions thirty-one through thirty-four of the questionnaires. It shows the level in the organization at which this position is required to operate and the corresponding mean questionnaire value for that position. The responses answering the question/statement are tabulated in the following order:

- a. At what level in the organization is this position (slot) assigned?
- b. Column two contains the calculated mean value from the supervisors' responses to questions one through thirty.
- c. How long has this officer been under your supervision?
- d. Is this position (slot) manned by an officer with the required experience level?
- e. What are the qualifications an officer would need to possess in order to perform the duties in this position?

This information is provided to the reader to aid in understanding the complexity of the positions of the selected AFSC's within Acquisition Logistics Division that were polled.

# Responses to Questions 31-34 With Levels Identified (662X AFSC)

Level	$\bar{x}$	Years in Position	Req'd Experience Level	Comments
* 1. Deputate	4.46	1 yr	yes	Logistic experience, System Program Office (SPO) experience.
2. Directorate	4.4	vacant	no	Total Logistics experience, very knowledgeable in engineering concepts, maintenance, supply, budget, international logistics.
** 3. Directorate	2.61	5 mo	yes	Fully qualified 662X, ALC experience.
4. Directorate	4.25	2 mo	yes	Depot experience, system management and base level, Advanced degree MBA or AFIT, analytical mind, cooperative
5. Directorate	4.01	9 mo	yes	Five years maintenance experience, 2yrs wholesale Logistics, 2yrs acquisition management, Masters degree in Logistics.
6. Directorate	4.06	9 mo	yes	Same as questionnaire 5.
7. Directorate	3.52	2 yrs	yes	Minimum 7 years Air Force Experience, maintenance/training background, advanced degree in Logistics or business, aggressive, good writing and speaking ability, Acquisition logistics experience, knowledge through attendance of AFIT short course or education with industry.

	8. Directorate	4.24	1 yr	requirements	
					Field grade officer, maintenance needed experience, advanced degree in business administration, logistics or comparable, aggressive, good writing and speaking ability, well versed in human relations, Acquisition logistics experience.
	9. Directorate	3.31	4 yrs	yes	Creativity, perceptivity, tolerance and initiative needed.
	10. Directorate	3.31	vacant		same as questionnaire 9.
	11. Directorate	3.31	2 yrs	yes	same as questionnaire 9
	12. Division	4.3	1 yr	yes	Advanced degree in systems logistics, knowledge of commercial logistics infrastructure, familiarity with system management responsibility.
	13. Branch	2.89	9mo	no	Basic 662X knowledge, background in International logistics, program manager experience, tour at major command, numbered Air Force would benefit.
	14. Division	3.28	19 mo	yes	3-5 years experience as 6624, prefer experience in ALC, SPO, base, wing, intermediate headquarters and Major command, B.S. in Engineering or Management, MS in Management.
	15. Division	3.28	19 mo	yes	Same as questionnaire 14.

16. Division	3.28	19 mo	yes	Same as questionnaire 14.
17. Division	3.28	11 mo	no	Same as questionnaire 14
18. Directorate	4.13	1yr	yes	Advanced degree in logistics and system management, depot or flight line experience. Leadership, creativity, stamina and assertiveness, able to handle multiple tasks.

# AAD  
 C ##Non AAD

# Responses to Questions 31-34 With Levels Identified (402X AFSC)

Level	$\bar{x}$	Years in Position	Req'd Experience Level	Comments
1. Directorate	4.19	vacant	no	Worldwide knowledge of Engine maintenance with technical expertise of engine and other fields of logistics.
2. Directorate	3.67	2 mo.	moderately	Prefer SAC maintenance, analytical mind, work well with other agencies, technical appreciation for maintenance requirements and weapon systems.
3. Division	3.66	6 mo.	yes	Minimum of 4 years as an aircraft maintenance officer, Advanced degree in Business Administration or Logistics.
4. Division	3.14	vacant	vacant	3-5 years experience as 4024, prefer experience at base, intermediate or MAJCOM staff level of maintenance, also prefer SPO experience. Bachelor's degree in engineering or management, Masters degree in management.
5. Division	3.14	vacant	vacant	Same as questionnaire 4

6. Deputate	3.62	2 yrs	yes	Advanced Logistic Systems Management degree, experience with Electronic warfare equipment, tenacity, sensitivity to human engineering/efficiency.
7. Division	4.19	2 yrs	yes	Advanced degree Systems and Logistic, Education with industry.
8. Division	4.13	1 yr	yes	Formal and actual training-Mature, responsible, able to apply academic and practical knowledge of supportability to new systems in a timely manner in order to achieve supportability and still be sensitive to operational requirements.
9. Directorate	3.51	4 mo	yes	Prefer aircraft systems maintenance experience at MAJCOM or NAF level, knowledge of AFLC support system and organization, definite assertiveness.
**10. Branch	3.07	1 yr	moderately	Base level maintenance, ALC or HQ AFLC experience, knowledge of acquisition process.

\*AAD  
\*\*Non AAD

# EVALUATION OF LEVELS

402X AFSC (10 positions)

Deputate = 1 = 3.62

Directorate = 3 =  $4.19 + 3.67 + 3.51 = 11.37/3 = \underline{3.79}$

Division = 5 =  $3.66 + 3.14 + 3.08 + 4.19 + 4.13 = 18.2$

$18.2/5 = \underline{3.64}$

Value with Branch position included

$18.2 + 3.07 = 21.67/6 = 3.54$

Branch = 1 = 3.07

662X AFSC (18 Positions)

Deputate = 1 = 4.46

Directorate = 11 =  $4.4 + 2.61 + 4.25 + 4.01 + 4.06 + 3.5$

$+4.24 + 3.31 + 3.31 + 3.31 + 4.13$

$= 41.16/11 = \underline{3.74}$

Division = 5 =  $4.3 + 3.28 + 3.28 + 3.28 + 3.28 = 17.42$

$17.42/5 = \underline{3.48}$

Value with Branch position included

$= 17.41 + 2.89 = 20.31/6 = \underline{3.38}$

Branch = 1 = 2.89

APPENDIX D  
INSTRUCTIONS FOR ADMINISTERING THE QUESTIONNAIRES

### Instructions for Administering the Questionnaires

1. Introduction of thesis team.
2. Allow supervisor to read the cover letter.
3. Answer questions that clarify details about cover letter only.
4. Emphasize:
  - a. Want supervisor to evaluate the position (slot) not the person.
  - b. Return the completed questionnaire in the sealed envelope with no identifying marks and the thesis team will be the only persons to review the responses - maintain anonymity.
  - c. No reprisal for responses on questionnaire.
  - d. This will be one of the last inputs provided Air Force prior to implementation of the percentage-based system for assigning Advanced Academic degree holders.
5. Encourage open, candid answer to questions 31-34.
6. We have broken out AFALD into three organizational levels.
  - a. Commanders Staff and Deputate
  - b. Directorate
  - c. Division and Branch

Please specify at what organizational level this position is assigned.

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